There are three overarching issues concerning Phase II/Delta flows scenario development:

How should delta requirements be tied to upstream conditions? Delta flow standards could be crafted in such a way that they do not require any upstream actions. I.e. FERC requirements, flood control, navigational flows, Vernalis flows, Wilkins Slough requirements, delta WQ standards, upstream BO requirements, etc. could together determine inflow requirements that outflow requirements some fraction of as required inflow. This would negate conflict between upstream cold water pool and delta outflow needs. If the SWRCB were to use its authority to compel other waterusers to contribute to required delta flows, that would give DWR and CVP more flexibility in their reservoir management and delta exports. On the other hand, delta flow requirements could be tied to conditions when upstream impacts would be minimal; I offer several examples of such linkages at the end of this document.

Can standards be combined to achieve multiple goals and what standards are most effective in achieving goals? For instance, Yolo Bypass inundates at about the same level of river flow as is required to meet Roe Island outflow requirements; could these be combined into some sort of 'flood management for fish' standard? Similarly, Old and Middle River flows are affected by the amount of water coming through the Delta Cross Channel and Georgiana Slough; to what extent can management of the DCC be tied to flow requirements in Old and Middle River? Are Old and Middle River flows complementary to E:I ratio standards or duplicative in their effect?

Can flow recommendations be part of the evaluation and adaptive management process identified in the flows report? Must flow requirements, however they might be stated, be explicitly linked to predicted and measurable environmental effects.

Options for Outflow and Export Impact standards

The following discussion of outflow objectives and export restrictions is a 'chinese menu' of options rather than one preferred scenario. From the menu we can then select a suite of actions, or even multiple suites of actions, to suggest to the state board. Different agencies may prefer different suites but the goal is to take the broad advice we have given the board and show how it could be productively followed. I have included one scenario at the end based on the DFG flow recommendations as a starting point

I give a short explanation of why each option might be attractive – I have tried to generate as many options as possible so some of the explanations might not be very convincing. I make no effort to point out their faults.

Outflow objectives.

A. Feb-Jun requirements – present requirements impose higher and more variable springtime conditions than occurred in the years immediately prior to their adoption.
   1. Leave as is. POD studies suggest that new problems have risen in impact, not that habitat and entrainment reduction in the spring are unimportant or that the current requirements are inadequate.
   2. Leave as is but extend coverage of X2 requirements to January 1, or date of first flush event, whichever comes sooner.
   3. Remove the Roe Island **trigger** so that if precipitation is high enough to call for X2 < 65 for some month, than flows to meet that are required, even if the low salinity zone is not yet downstream of Roe Island. This would ensure much higher variability in outflow and river flow in the spring and would likely achieve higher levels of variability as recommended by many commenters.
   4. Combine Roe Island trigger with a new Yolo Bypass flooding trigger so that either Yolo Bypass flooding OR Roe Island salinity would trigger Roe Island requirement, to ensure that bypass flooding occurs for at least 30 days.

5. Remove the Roe Island **requirement**; recent modeling suggests that the area and volume of low salinity zone is similar for both Roe Island and Chipps requirements. Water saved from this change could be available for other uses, as to support salmon upmigration and improved estuarine habitats in the fall. This would allow management of water to address fishery needs, especially where the changes in channel form reduces the effectiveness of flow in restoring ecological function.
6. Revamp outflow a simple percentage of inflow to the eight major rivers from December to June on a lagged, 14 running average.
    a) SWRCB flows report calls generally for 75% to prevent further decline of aquatic resources, identifying a number of separate conditions that 75% would encompass.
    b) Currently San Joaquin flows represent an average of 33% of unimpaired flow and discussion seems to be about increasing that to 35%

B. Other months – Resident fishes require habitat year-round, so protecting area of suitable habitat is essential for long-term planning.
1. Leave as is. I can offer no reasoning in support of this approach. The present requirements seldom limit operations. Requirements vary by year-type, ranging from 3000 cfs to 4500 cfs from August through January and 4000-8000 cfs in July, putting the LSZ upstream of 85 km in all months of all years except for July of wet years. CCWD or ag salinity standards can limit operations. Otherwise exports are limited by E:I ratio, permitted pumping capacity, or water availability.
2. Set seasonal/monthly requirements (relative to conditions pre-2000) based on volume of upstream storage or springtime year type. This was the basis for Delta Smelt BO requirements for Sep-Nov in Wet and Above Normal years.
3. Set seasonal/monthly requirements relative to conditions pre-1972. Clean Water Act requires that aquatic conditions be no worse than when the act was signed (anti-degradation). This was the basis for the current X2 requirements for Feb-Jun. based on a trigger of reservoir fullness at the end of June.

Export Impacts – Entrainment and indirect effects of pumping.

1. Export:Inflow ratios. Leave as is. I can offer no reasoning in support of this approach. The E:I ratios do not produce any measurable or predictable change in field conditions, do not ensure any minimum flows in delta channels, and do not protect San Joaquin River flows and fish. They provide no guidance for long-term planning because there is not agreement on what constitutes inflows or exports for alternative withdrawal locations.
2. Add I:E ratios as in the NMFS BO to ensure protection for San Joaquin resources.
    a. Add springtime I:E ratios as per the NMFS BO.
    b. Add fall I:E ratios requirements of no less than .33 in October for 14-days to provide attraction for adult fall-run salmon and steelhead, coordinated with upstream attraction flow releases.
3. For purposes of regulating E:I ratios,
    a. Define exports as inclusive of all water removed from the legal boundaries of the delta and inflows as the sum of all inflows to the delta, I.e. CVP, SWP, CCWD, Sacramento, Stockton, and other municipal diverters.
    b. Define as exports all inter-basin transfers, in delta or above the delta. I.e. CVP, SWP, CCWD, SFPUC, EBMUD, Friant transfers out of basin, etc.
4. Old and Middle River flows, including upper Old River. Adopt BO restrictions as part of new WQCP. These are measurable and are directly associated with salvage rates as a measure of export impacts.
5. Old and Middle River flows, including upper Old River. Allow day/night operations for times when Sacramento outmigrating salmon are dominant species of concern – i.e.

October through first flush after Christmas, open DCC gates during day and allow more negative O&M river flows when DCC is providing most of export water.

6. Old and Middle River flows, including upper Old River. Add restrictions of no-more-negative than -3000 cfs for two 5 day periods in October to guide San Joaquin adult fall run- and steelhead upmigration.

Some suites of conditions:

The current WQCP is not protecting aquatic resources according to the Board's flow report, the legislation requiring the flows report, and much testimony to the board for the flows report. Scoping comments on Phase II from DOI, NMFS and DFG explicitly say that the Biological Opinions are inadequate to the task of ecosystem protection required of SWRCB under the Clean Water Act.

The 2009 SWRCB staff report on the WQCP suggests that "Additional Delta outflow recommendations are likely to come from the BDCP and other planning efforts currently under way." However, BDCP has made no such recommendations and public comments by state leaders of BDCP indicate that they see outflow requirements as being the purview of the SWRCB, not BDCP.

Therefore, suites adequate to the task must offer more protection than provided by the Biological Opinions and the 2006 WQCP upon which they are based.

In 2010 two reports offered suites of actions to protect resources more broadly than the BOs:

SWRCB flows report. To halt "the population decline and increase populations of native species as well as species of commercial and recreational importance." Delta outflow is protected as 75% of unimpaired flows into the watershed in the Jan-Jun period. San Joaquin salmon attraction inflows to delta of 3600 cfs for 14 days with accompanying export rates no more than 3 times that amount.

DFG flow recommendations, are generally consistent with the 2006 WQCP, the FWS and NMFS Biological Opinions Biological Opinions, but expands periods of outflow protection to Jan-Jun, and adds 14 days when exports are no more than 3 times the inflow of the San Joaquin.

The major scientific advances since the development of these suites are the detailed modeling of the low salinity zone under different outflow conditions, investigations into migratory behavior of smelt and salmon in relation to river flow, and studies of ecosystem processes in the low salinity zone in the fall.

To refine the DFG recommendations in light of recent information suggests 3 changes:

1. extend DCC closure, and Old and Middle River flow restrictions to November through February, tied to changes in turbidity and/or Sacramento River flow
2. Changes in outflow requirements must not reduce currently protected areas or volumes of low salinity zone as modeled and corroborated by field measurements
    a. For spring this may mean current flow requirements should be interpreted in terms of area or volume instead of river kilometer location. The UnTRIM model provides one good tool for this task.
    b. UnTRIM model outputs suggest that current Fall X2 requirements achieve little areal or volumetric change in Above Normal years, compared to drier years. Further the use of year-type does not adequately reflect the highly variable conditions that are encompassed by the five year classifications. Changes in area and volume of the low salinity zone are small for most values of X2 >81. Therefore fall X2 is unlikely to achieve benefits at outflows less than 12000 cfs.
        i. Flows to support the low salinity zone in Fall should aim to achieve benefits for different durations rather than at different outflows, i.e. X2<74 or outflows >12000 cfs.
        ii. Flows should probably be required in October, with September and November

added on under wetter conditions (see triggers below)

c. To ensure that the fall outflow requirements are effective and limited to years when they would not reduce upstream coldwater pools and carryover storage several triggers are possible:
    i. Require outflows only in years when 2 or more of the 4 major upstream reservoirs on the Sacramento are making flood control releases – i.e. Shasta, Oroville, Englebright and Nimbus. 30 days when only 2, 60 days when 3 and 90 days when all 4.
    ii. Require fall outflows when total delta exports for the preceding 11 months exceed a minimum. 30 days for 5 MAF ranging linearly up to 90 when exports exceed 6 MAF
    iii. Require outflows based on end of June Storage on all 8 major dams, linearly up from 30 days as a percentage of average storage above long-term averages for years in which flood releases have been made.
    iv. Identify flood-management flows in Sep-Nov as salmon attraction flows protected, requiring that outflows at Vernalis be augmented by volumes corresponding to such upstream releases.